

Back pain link to 24-hour body clock revealed

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Credit: University of Manchester

New research by University of Manchester scientists has for the first time shown that our spinal discs have 24-hour body clocks which when

they malfunction, can contribute to lower back pain.

Lower back pain is amongst the most prevalent spinal diseases associated with increasing age, with over 80% of the UK population predicted to experience back pain within their lifetime. Progressive degeneration of the spine disc is a major contributing factor.

The study led by Dr Qing-Jun Meng and Professor Judith Hoyland could have important implications on the understanding and treatment of the condition. Their findings have been published in the journal *Annals of the Rheumatic Diseases* today .

Ageing and inflammation, say the scientists, are major causes of disc degeneration and [lower back pain](#). In this research, both conditions were found to cause body clock malfunction.

The team say getting a good night's sleep will protect our [body clocks](#) and potentially avoid disc problems later in life. Avoiding night working where possible, or working fixed regular hours, as opposed to rotating shift work, they say, will also help.

Additionally, the non-steroidal anti-inflammatory drugs we take for back pain will be more effective if we take into account our natural body clock cycle, by timing treatment to anticipate pain, they add.

Dr Meng, who is a Senior Research Fellow funded by Arthritis Research UK, said: "It has been known for years that, as a consequence of the daily activity and resting cycle, we are taller in the mornings by up to 2cm more than when we go to bed.

"The discovery of body clocks in the disc may go some way to explain, for the first time, the science behind this rhythmic physiology of the spine.

"Our research shows that this system is regulated by our internal body clock and when the body clock ceases to work properly during ageing or in shift workers, lower back pain is more likely to become an issue."

He added: "Looking after your body clock will help manage or delay the onset of your back pain."

"And based on our findings, we hope that one day, we may be able to combine NSAIDs with clock targeting compounds to provide a more powerful solution."

Dr Natalie Carter, head of research liaison and evaluation at the charity Arthritis Research UK, said:

"This research is very interesting and is a significant breakthrough in our understanding of lower back pain. Many people find that their symptoms get worse at certain times of the day and the results of this study reveal a likely biological basis to this effect."

"As a charity we know that living in pain, day in and day out, can have a devastating impact on people's lives, affecting their independence, mobility and ability to stay in work. If we are going to address this growing need, we need better pain management and better treatments to relieve pain. An exciting prospect is that it may be possible to use this new information improve treatments and [pain](#) relief for people affected by this debilitating condition."

The 24-hour body clock was revealed to be present in the disc tissue of transgenic mice and human samples. Though the investigation of human disc cells was more complex, both results were consistent with each other.

The team tracked a 'clock' protein which shows the presence of the body

clock using bioluminescent markers, whose flashes correspond to clock activity of the disc.

A fascinating video, made by the scientists, shows how inflammation disrupts the body clock in living disc tissue which then recovers following treatment.

Professor Hoyland said: "Our research shows that if you remove the body clock from cells in the disc in mice, within 6 months degeneration is very noticeable and the disc is thinner by 20 to 30%.

"Within 12 months, we found evidence of fibrosis, the thickening and scarring of connective tissue prevalent in human degenerative disc.

"This accelerated ageing of the disc in a "clockless" model indicates that having a robust body clock will help slow down spinal aging and associated spinal diseases."

"We were also excited to find 607 rhythmic genes which exist in in disc tissue. Many of these genes are implicated in key pathways involved in the health of the disc."

More information: Michal Dudek et al. The intervertebral disc contains intrinsic circadian clocks that are regulated by age and cytokines and linked to degeneration, *Annals of the Rheumatic Diseases* (2016). [DOI: 10.1136/annrheumdis-2016-209428](https://doi.org/10.1136/annrheumdis-2016-209428)

Provided by University of Manchester

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